LEAN OFFICE: A Systematic Literature Review

Abstract

After its discovery by the western world, companies adopted the principles of lean thinking for activities other than production, however, there is still no robust body of research for these new fields. The main objective of this paper is to analyze the evolution of scientific production on the subject of lean office quantitatively and qualitatively. A better understanding of the subject from its origin is sought, as well as identifying the most explored sectors about the lean office. The Isi Web of Knowledge database was used, after filtering, to analyze a sample of 18 articles on the topic. The results are presented through quantitative and qualitative statistics, organizing the researchers' findings and inviting those interested in the topic to debate in areas ranging from the tools used to the impact on employees who joined the lean office.

Keywords: *Lean office. Lean thinking*. Systematic review.

1. Introduction

Businesses need to be competitive, and for those who want to remain on this trajectory, they must constantly seek to improve their operations (Hallavo, Kuula & Putkiranta, 2018; Julião & Gaspar, 2021). Managers need to keep in mind that effectiveness is a pursuit of any company in order to achieve strategic objectives and improve techniques that enable more productivity with the use of fewer resources (Cavaglieri & Juliani, 2016). It should also be reflected in the history in which companies are operating, in which organizations are no longer local to become global (Magalhães, Alves, Costa & Rodrigues, 2019), with all its benefits and competitiveness challenges (Yokoyama, Oliveira & Futami, 2019).

Competition between organizations raised the level of demand and efficiency of processes, which in practice resulted in the need to apply continuous improvement for both products and services (Monteiro, Pacheco, Dinis-Carvalho & Paiva, 2015). Lean principles are presented as a solution for implementing a culture of identification and elimination of waste, collaborating to fulfill the strategic objectives of organizations. The implementation of lean thinking is becoming an essential competency for any type of organization (Bortolotti, Romano & Nicoletti, 2009; Sundar, Balaji & Kumar, 2014). As stated by Kämpf (2018) lean is a registered mark of a leap of productive forces in society, its practices promote the growth of companies (Ward, Bickford & Leong, 1996).

Lean thinking or lean thinking started to be applied in other areas of companies (Stone, 2012), as well as economic sectors. Areas such as software development, healthcare, services and others (Narayanamurthy, Gurumurthy & Chockalingam, 2017) have embraced lean thinking. Among these applications there is a concept aimed at optimizing administrative and office activities that is called lean office. According to Tapping and Shuker (2010), lean office is a concept that deserves to be highlighted, especially when it is verified that between 60% and 80% of all costs involved to satisfy a client's demand are of an administrative nature. Office operations represent a multitude of opportunities for process improvement since more than 50% of the total time to ship a product and a cost of 25% to 35% are related to administrative activities (Hyer & Wemmerlov, 2002).

The administrative environment is also relevant regarding the workforce. In the case of the West, it represents 50% to 80% of workers (Danielsson, 2013). When offices or service areas are mapped from the perspective of whether their processes add value or not to the next stage, waste represents around 90%, in other words, only 10% of the activities performed add value to the customer or to the next stage of the process (da Silva, Seraphim, Agostinho, Lima & Batalha, 2015; Magalhães et al., 2019). This fact highlights the importance of processes

associated with administrative areas, since the application of this methodology allows reducing activities that do not add value to the customer (Monteiro, Alves & Carvalho, 2017).

Since the beginning of the 90's, lean office implementation has become a productive initiative to promote organizational changes in companies and institutions in Brazil and in other countries (Yokoyama *et al.*, 2019). Through lean office, organizations seek to improve their operational efficiency and productivity by reviewing their administrative processes in which waste flows are identified and eliminated whenever possible (Freitas, Freitas, de Menezes & Odorczyk, 2018). It should also be noted that lean thinking-related techniques contribute to gains in efficiency and flexibility, in addition to reducing the response time to changes through a process-based approach (de Almeida, Galina, Grande & Brum, 2017).

For administrative areas, the concept also aims to identify waste and optimize processes. However, one of the main challenges of the lean office is to reduce and eliminate waste in the information and knowledge value stream, as these are variables that are difficult to control (Stanke & Murman, 2002). In addition, historically, a low percentage of generated information adds value (Sony, Naik & Therisa, 2019). The application of lean concepts in administrative areas is more complex compared to production areas. This is because most activities that generate information or services make it difficult to identify waste.

The main objective of this paper is to analyze the evolution of scientific production on the subject of lean office quantitatively and qualitatively. A better understanding of the subject from its origin is sought, as well as identifying the most explored sectors about the lean office, in addition to calling the debate for research gaps identified in this paper.

2. Literature review

2.1. Lean thinking

Lean thinking was only popularized in 1990 through the book "The machine that changed the world" written by Womack and Jones (Katayama & Bennett, 1996; Staats & Upton, 2009 apud Secchi & Camuffo, 2019; Arlbjørn, Freytag & de Haas, 2011 apud de Almeida *et al.*, 2017). Based on the Toyota production system, the main objective of this philosophy is to develop the organization's ability to see waste and subsequently eliminate it (Freitas et al., 2018; Leyer, Reus & Moormann, 2020). This pillar is so strongly linked to Japanese culture that it took some time for the West to understand the reason for the difference in efficiency when compared to Japanese factories (Lewis, 2000). After a five-year study (1985-1990) conducted by the International Motor Vehicle Program, which carried out a collaborative investigation of several academic institutions and 36 partner automotive industries, the term lean thinking was created as a translation of the way Toyota developed to manage its factory plants (Piercy & Rich, 2009 apud Secchi & Camuffo, 2019; de Almeida *et al*., 2017; Lewis, 2000).

In the literature we have the development of lean separated into four phases, the first one focusing on cells and assembly lines that lasted from 1980-1990, the second focused on the factory floor in the 1990s, the third also in the same decade, until 1999, focused on value stream and from the year 2000 onwards focused on value systems (Arlbjørn, *et al*. 2011 apud de Almeida *et al*., 2017). Authors such as Stone (2012) divide lean into five phases which are: discovery phase 1970-1990, dissemination phase 1991-1996, implementation phase 1997-2000, business phase 2001-2005 and the performance phase starting in 2006 and going until 2009. There was also a separation of lean into two major topics, namely strategic lean and operational lean. The first is focused on lean thinking, while the second is related to shop floor operations, it is important to understand that lean also goes far beyond being just a strategy for reducing waste. There is a proposed division that brings three layers to the theme. The first can be called the basic philosophy, the second is based on the five principles learned from Toyota

that will be described below, and the third covering the tool package that lean brings (Karlsson & Åhlström, 1996 apud Arlbjørn *et al*., 2011).

The concept is still being studied, but it can be considered as a management philosophy and strategy that focuses on creating value for the customer by eliminating activities that do not add value or hinder the system's operation (Di Pietro, Mugion & Renzi, 2013 apud de Almeida *et al*., 2017; Shamah, 2013 apud de Almeida *et al*., 2017). Womack and Jones (2003) defined five principles for lean thinking, they are: value: what results in satisfaction and solves the customer's need; Value Stream: what in the activity stream is recognized as customer value, Continuous Stream: uninterrupted, in order to ensure that activities flow through the process; Pulled Flow: means starting the production of a good or service only when demanded by the customer; Perfection: Aim to eliminate all waste from the process in order to ensure maximum efficiency and zero rework (Knol, Slomp, Schouteten & Lauche, 2019).

Understanding the principles of lean thinking has become fundamental to deploy the concept in any other type of segment or activity that is not industrial. The application of the same has had a significant impact both in academia and in productive circles since its creation (Hines, Holweg & Rich, 2004 apud de Almeida *et al*., 2017).

2.2. Lean office

Part of the companies in the market have facilities to carry out administrative processes of the most varied types. These processes have as their main input or resource information and it can appear in numerous states (printed, digital, electronic, graphic or oral). Administrative processes are based on the manipulation of data that is processed and shared to become available at all levels of the organization (Malacarne, Taquetti, Mourão, Zattar & Seleme, 2018; Freitas & Freitas, 2020). It is now more than recognized by organizations that superior service provision is as important as product sales. Customers can be lost due to bad administrative processes (Sabur & Simatupang, 2015; apud Freitas & Freitas, 2020).

The lean office concept derives from lean thinking that, as stated above, was proposed based on the Toyota production model where waste must be eliminated. However, it is noteworthy that lean office is not about reducing people and resources, instead, it focuses its efforts on generating value for customers, eliminating waste, speeding up operations and reducing downtime created by bureaucracy (Cudney & Elrod, 2011; Cavaglieri, 2015). The book “Value Stream Management for the Lean Office: Eight Steps to Planning, Mapping, and Sustaining Lean Improvements in Administrative Areas” by Tapping and Shuker (2010) is considered a translation of lean thinking to administrative areas in eight steps: commit to lean, choose the value stream, learn about lean, map the current state, identify lean metrics, map the future state, create Kaizen plans, implement Kaizen plans to plan.

The application of lean in administrative areas has spread to increase customer satisfaction (Apte & Goh, 2004 apud Secchi & Camuffo, 2019; Sabur & Simatupang, 2015 apud Freitas & Freitas, 2020; Boriolo, 2018). It is noteworthy that the seven wastes identified in the manufacturing environment can be located in the administrative environment. However, identifying office waste can be relatively more difficult due to the intangible nature of the information factor (Cavaglieri, 2015; de Almeida *et al.*, 2017). Table 1 was assembled to show the difference between the waste recommended in lean thinking when translated to lean office.

Table 1. Comparison of the understanding of waste between Lean Thinking and Lean Office

Waste	*Lean Thinking*	*Lean Office*
Transportation	Excessive transport of materials, causing unnecessary expenditure of capital, time and energy.	Excessive use of computer systems in communications, transport of information not necessary electronically or physically.

Inventory	Spare stock either intermediate products between the process steps or the final product. It directly impacts the company's cash, since the money is stopped in the form of inventory.	Unnecessary files even if digital, extra supplies and unnecessary copies.
Movement	Unnecessary movement in the environment, whether to look for a tool or a layout error where workstations are far away.	People moving unnecessarily in the office, for example, layouts that do not favor communication, forcing the employee to move to the next workstation.
Waiting	Long periods of idleness of people and parts, resulting from machines stopped during maintenance or preparation (set up), or people waiting for information, drawings, specifications, parts, etc.	In the office environment, this waste translates into waiting for subscriptions, phone calls, machines or supplies.
Over Processing	When you do actions to produce something that doesn't need to be done. That even if they were eliminated, they would not be missed. People checking things that have been checked before or processes that made sense under certain conditions, but no longer.	When more information is generated than required by the customer, the office is able to see redundant activities, unnecessary e-mail exchanges, excessive printing of papers and reports.
Overproduction	Production above customer demand, whether due to lack of synchronization of process steps, batch size or even precision in anticipating production to ensure stock availability.	Paper and information often not used by other employees.
Defects	Product quality problem that generates scrap or rework, one of the most common in processes.	Wrong reports, systems with unreliable data, equipment that crashes, anything that causes any rework for the task.

Source: The authors.

In addition to different lenses to see waste, lean office also brings the need to learn that in office environments other types of waste arise linked to the most varied definitions, as shown in Table 2.

Table 2. Lean Office specific waste

Waste	Definition
Alignments	It's the energy expended by people working with misunderstood goals and the effort needed to correct the problem and produce the expected result.
Assignment	It is the effort used to complete an inappropriate and unnecessary task.
Control	It is the energy used to control and monitor that does not produce performance improvements.
Variability	These are resources used to compensate or correct results that vary from what is expected.
Alterations	It is the effort used to arbitrarily change a process without knowing all the consequences and subsequent efforts to compensate for the unintended consequences
Strategy	It's the value lost by implementing processes that satisfy short-term goals but don't add value to customers and investors
Confiability	It is the effort required to correct unpredictable results due to unknown causes.
Standardization	It is the energy expended because a job has not been done in the best possible way by all those responsible.

Suboptimization	It is caused by the competition of two processes, in the best case the waste will be the duplicated work, but it can reach the compromise of both processes and the degradation of the final result.
Schedule	It is the misuse of schedules.
Informal processes	It occurs when resources are used to create and maintain informal processes that replace official processes or that conflict with other informal processes, as well as resources used to correct errors caused by this system.
Unnecessary checks	It is the effort used for inspections and reworks.
Translation	It is the effort required to change data, formats and reports between steps in a process or those responsible for it.
Lost information	It occurs when resources are required to repair or compensate for the consequences of missing key information.
Lack of integration	It is the effort required to transfer information (or materials) within an organization (department or groups) that are not fully integrated into the chain of processes used.
Irrelevance	Efforts to deal with unnecessary information or efforts to fix problems it causes.
Inaccuracy	It is the effort used to create incorrect information or to deal with the consequences of this.
Secondary processes	These are the resources spent on secondary processes that cannot yet be used by the following steps in the process.
Lack of focus	It occurs whenever an employee's energy and attention are not focused on the organization's critical objectives.
Discipline	It occurs whenever there is a failure in the system of accurate identification and quick reaction against negligence, lack of responsibility and problems related to the discipline expected from employees.
Mastery	Occurs whenever an opportunity to increase an employee's mastery of their workspace is not used;

Source: The authors.

Thus, it is highlighted in the literature that adaptations that need to be made in the transition from the application of lean thinking to informational areas. Sabur and Simatupang (2015) even bring customizations in some metrics such as Takt Time and Pitch. Tapping and Shunker (2010) also adapted tools such as value stream mapping, proposing new symbols for specific situations in administrative environments.

3. Methodological procedures

Systematic review began to be used as a practical statistical tool to understand the behavior of the literature and its evolution according to context and time (Malacarne *et al.*, 2018). It can be understood as the fraction of the bibliography that deals with the measure or quantity applied to the book, seeking a profile of knowledge records, using a quantifiable method (Malacarne *et al.*, 2018). The method is used for mapping research paths, which enables the creation of indicators for information management and identification of less or more studied areas (Subramanyam, 1982).

To classify the results found in a research, there are three most used bibliometric laws: Zipf's, Lotka's and Bradford's law (Otlet, 1986). Zipf's law deals with measuring the frequency at which keywords appear in a text. Lotka's law, on the other hand, assesses the scientific production of a given researcher. Therefore, it is understood that the more publications a certain researcher has made, the more renowned and prestigious he is. Finally, Bradford's law is about measuring the relevance of the journals in which the search terms were published. Once the

studies are classified, data become information and conclusions can be drawn, collaborating so that the subjectivity on a given subject also decreases. It is possible to make other important correlations such as citation, methods and principles, and even the geographic position from which the studies are being published.

The definition of the sample for this study followed the steps as required by the systematic review procedure. First, a database was defined, the keyword "Lean Office*" was selected, the types of research (academic papers) were selected and the publication period was determined, which was from 1970 to 2019. The chosen database was Isi Web of Knowledge, selected because it is a bank that brings together publications with wide international dissemination. This bank has over 90 million publications from 1900 to the present.

The choice of keywords was made based on the proposed theme. Table 3 (Search Results) shows the keywords, total publications found, filters performed, total results obtained from papers for the analysis in the period between 1985 and 2019. The research areas selected for all searches were: (1) management, business, green sustainable technology, business finance; (2) Business economics, public administration, development studies, environmental science ecology, social science. The types of research found were national and international scientific papers.

After the result found, an analysis of the relevance of the newspapers was carried out, considering only the criteria A1, A2, B1 of CAPES and Q1 and Q2 SCIMAGO, frequency of keywords in the text, evolution of publications in the researched period, number of publications by countries, citations and cocitations and finally analysis of the main authors as described in the algorithm in Table 3:

Table 3. Criteria for selection of the "lean office" ordinal bibliometric sample

Step	**Criteria**	**Nº of papers**
1. Search for papers in the database	**Criteria of inclusion:** Keyword 1: "lean office" in the title, abstract or keywords **Filtered by:** **a) Areas:** *management*, *business* / *green sustainable technology* / *business finance* / *business economics* / *public administration* / *development studies* / *environmental Science ecology* / *social Science* **b) Language:** English/Portuguese **c) Type of Document:** Papers	238
2. Journal Classification	**Classification:** A1, A2, B1 para CAPES e Q1 e Q2 SCIMAGO	177
3. Article collection (checked by abstract title)	**Criteria of exclusion:** exclude papers that do not talk about lean office in the title or abstract	27
4. Analysis of papers (removal of duplicates and evaluation of all content)	**Criteria of exclusion:** Delete duplicate papers	18
TOTAL		18 papers for review

Source: The authors.

4. Quantitative analysis of results

Among the papers found with the keyword lean office, 238 papers with the keyword were obtained. The same criteria mentioned above were used and a sample of 18 papers was

reached. Publications were analyzed over time and, as can be seen graphically in Figure 1, from 2008 onwards, interest in the topic has been growing over time.

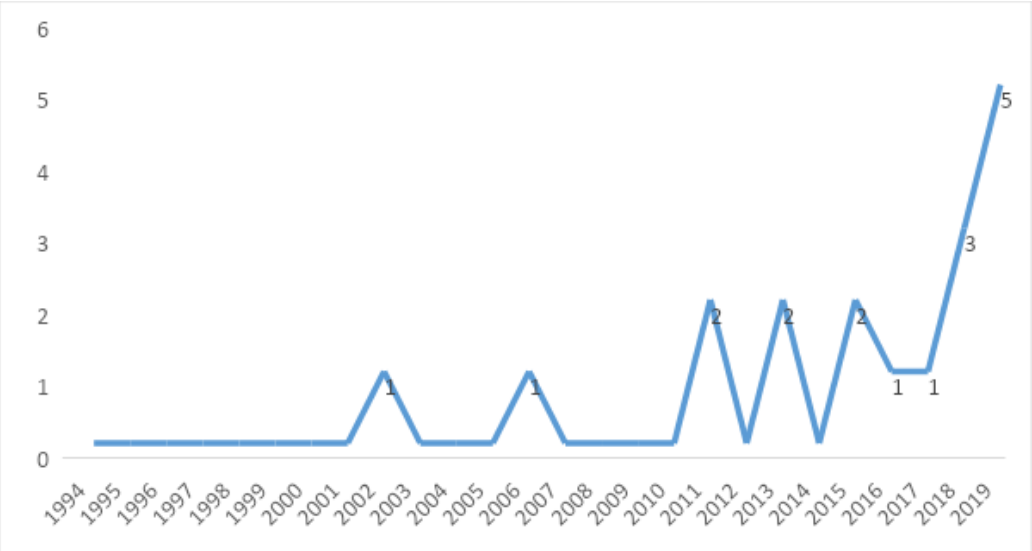

Figure 1. Evolution of the number of publications in the researched period (1994 – 2020)
Source: The authors.

The first publication that refers to the theme was in 2002, where the authors Hyer and Wemmerlov (2002) write "The office that lean built", showing that office waste is expressive as well as in manufacturing, but the interest in the subject is still embryonic even in growth trend. In 2019, 5 publications were made, making it the peak of this timeline.

When publications by country are analyzed we see a predominance of the United Kingdom and the United States with 53% and 18% of publications, followed by Brazil with two publications and Holland, Serbia, Montenegro and Sweden each with one publication. This information can be better visualized in the graph in Figure 2.

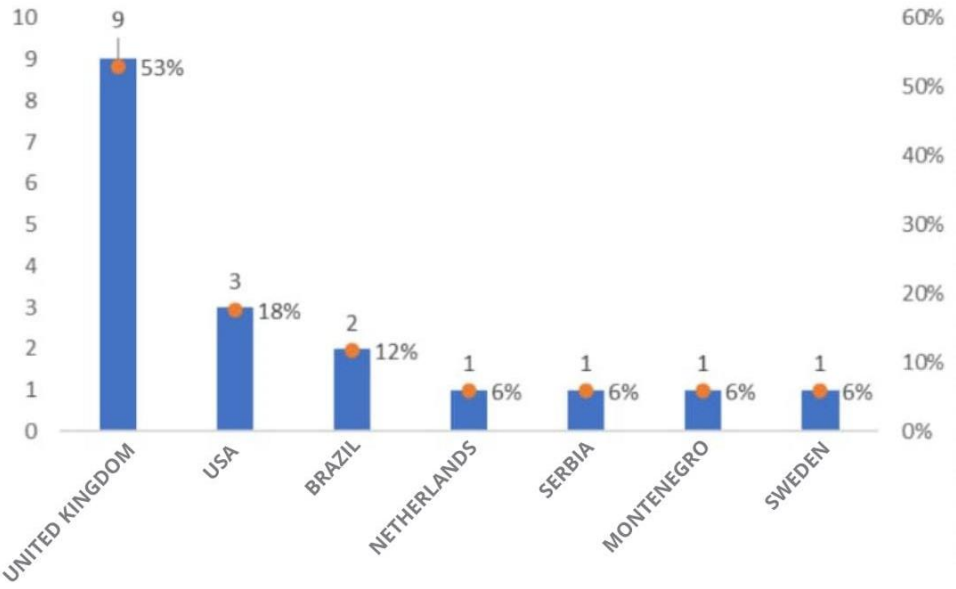

Figure 2. Number of publications by country and their percentages
Source: The authors.

Regarding the publication periodicals, the percentage of publications by source was described. From the sample of this bibliometry, 22% of the publications in the period studied were made by the "International Journal of Lean Six Sigma" in a total of 4 papers, from the second to the fifteenth identified journal, each one had a publication resulting in 6% representativeness of the total Sample. The papers were also classified according to the number of citations in order to identify which are the most relevant works, as shown in Table 4.

Table 4. List of most cited works, authors, journals, year and number of citations

#	Title	Authors	Journals	Year	Citations (nbr.)
1	*The Toyota way in services: The case of lean product development*	Liker, J. K.; Morgan, J. M.	*Academy of management perspectives*	2006	731
2	*'All they lack is a chain': lean and the new performance management in the British civil service*	Carter, B.; Danford, A.; Howcroft, D.; Richardson, H.; Smith, A.; Taylor, P.	*New technology work and employment*	2011	166
3	*An integrated approach between Lean and customer feedback tools: An empirical study in the public sector*	Di Pietro, L.; Mugion, R. G.; Renzi, M. F.	*Total quality management & business excellence*	2013	62
4	*An explorative review of the Lean office concept*	Danielsson, C. B.	*Journal of corporate real estate*	2013	52
5	*Lean Construction Submittal Process-A Case Study*	Garrett, D. F.; Lee, J.	*Quality engineering*	2010	47
6	*The office that lean built*	Hyer, N. L.; Wemmerlov, U.	*Iie solutions*	2002	42
7	*Lean thinking: planning and implementation in the public sector*	de Almeida, J. P. L.; Galina, S. V. R.; Grande, M. M.; Brum, D. G.	*International journal of lean six sigma*	2017	27
8	*Lean office in health organization in the Brazilian Army*	da Silva, I. B.; Seraphim, E. C.; Agostinho, O. L.; Jr, Lima, O. F.; Batalha, G. F.	*International journal of lean six sigma*	2015	25
9	*Implementing Lean Office: A Successful Case in Public Sector*	Monteiro, M. F. J. R.; Pacheco, C. C. L.; Dinis-Carvalho, J.; Paiva, F. C.	*FME transactions*	2015	22
10	*Lean Office contributions for organizational learning*	Freitas, R. de C.; Freitas, M. do C. D.; de Menezes, G. G.; Odorczyk, R. S.	*Journal of organizational change management*	2018	19
11	*Lean implementation failures: The role of organizational ambidexterity*	Secchi, R.; Camuffo, A.	*International journal of production economics*	2019	17

12	*Lean and White-Collar Work: Towards New Forms of Industrialisation of Knowledge Work and Office Jobs?*	Kämpf, T.	*TripleC-communication capitalism & critique*	2018	7
13	*A lean six sigma approach for improving university campus office moves*	Wheeler-Webb, J.; Furterer, S. L.	*International journal of lean six sigma*	2019	5
14	*Information management in lean office deployment contexts*	Freitas, R. de C.; Freitas, M. do C. D.	*International journal of lean six sigma*	2020	4
15	*Improving processes in a postgraduate office of a university through lean office tools*	Magalhães, J. C.; Alves, A. C.; Costa, N.; Rodrigues, A. R.	*International journal for quality research*	2019	4
16	*Lean office and digital transformation: a case study in a services company*	Besser Freitag, A.; Santos, J.; Reis, A.	*Brazilian journal of operations & production management*	2018	4
17	*How satisfied are employees with lean environments?*	Leyer, M.; Reus, M.; Moormann, J.	*Production planning & control*	2020	3
18	*Lean Archieves: The use of Lean Office in archive management*	Cavaglieri, M.; Juliani, J. P.	*Perspectivas em ciência da informação*	2016	3

Source: The authors.

Authors such as Liker and Morgan (2006), Danielsson (2013) and Kämpf (2018) brought conceptual approaches while the others explored case studies and practical applications for the theme. The theme as a whole lacks the attention of the scientific community for the organization and deepening of research (Piercy & Rich, 2009).

5. Qualitative analysis of results

Selected papers were analyzed and classified following parameters so that it was possible to categorize them, create dimensions for analysis and translate into an algorithm that can be used and updated at any time.

They were classified into theoretical and practical to define the approach to the article. To define which sector of application, classifications such as private, public and NA are applied. The areas of Educational Institution 34%, Public Agency 29%, Hospital Sector 19%, Software Development 6%, Construction 6%, Aviation 6% were the areas applied.

Practical studies represent the majority of publications, with 56% of the 18 selected papers and 44% are works that advance and consolidate the theory that is being built for the theme and reflect on applications and findings. As for the classification of works in relation to the public and private sectors, 56% of the works were carried out in the public sector and 22% in the private sector. Looking at the distribution of the application across the areas, we have the predominance of educational institutions with 29%, followed by public agencies with 12% and others.

The sectors of public universities and public agencies were the largest laboratories for applying lean office. Most of the works found in Isi Web of Knowledge are concentrated in these areas, but there are also applications in the hospital, construction and aviation sectors.

Finally, the classification regarding the methods, techniques and tools used in each study was defined, where VSM 29%, Kaizen 18%, 5S 11%, Standardized work 11%, Adapted Tools 7%, Work rotation 2%, Pareto 2% , Histogram 2%, Brainstorm 2%, Report A3 2%, Poka yoke 2%, Just in Time 4%, Visual Management 2%, Jidoka 2% and Heijunka 2% were identified.

The first conclusion is the homogeneity of lean manufacturing practices in the lean office, with Vsm or value stream mapping being the predominant tool in 29% of the works. Second comes the Kaizen concept with 18%. And lastly the 5S and standardized work are the tools identified in the sample. Another important fact of this article is the evidence of the category of "adapted tools" with 7% of the applications in the sample. This point opens a research window for lean office tooling that needs to be revisited in order to eliminate, adapt and create methods, principles and tools that best adhere to routines of an administrative nature.

To continue with the analysis, the classification Ways to see the principles, methods and tools, Application challenge, People, Solution proposal, Results, Approaches and Innovation in the theme was created for the conclusions found in each article.

In the category innovation in the theme, authors proposed adaptations in tools in addition to a hybrid way in the application of the principles to help change employees' mindsets (Cavaglieri & Juliani, 2016; de Almeida *et al*., 2017; Magalhães *et al*., 2019).

Also in the innovation category, authors such as Freitas et al. (2018) bring the application of lean office with an emphasis on teamwork as it is not yet explored. As the same approach is proposed by Danielsson (2013) once understood that the rigidity and standardization of traditional lean may not be so useful in administrative environments. The author calls for an approach centered on organizational learning, which makes teams empowered and, consequently, the entire company becomes capable of solving problems to achieve goals.

This approach requires the company to promote key points: a) Empower employees at team levels and individually; b) Leadership must avoid micromanagement by taking responsibility for results as a whole; c) Strong relational aspect such as the quality of work based on clear objectives; d) Leadership as a key factor in organizational learning.

In the category approaches, it is shown that in all studies, only traditional or Taylorist approaches were used (Freitas *et al.*, 2018) and it is concluded that the way the lean implementation process is organized influences the result (Secchi & Camuffo, 2019), and even deriving applications in administrative areas, the identification of failures needs to be transformed into opportunities for improvement (Magalhães *et al*., 2019).

For the results category, lean in general shows itself to be efficient, but with some records of not so expressive results. Silva *et al.* (2015) applied lean in a military institution and saw increased satisfaction and reduced anxiety.

It is also concluded that lean office reduces times and improves processes (Cavaglieri & Juliani, 2016; Freitas *et al*., 2018; Monteiro *et al*., 2015).

In the category of proposed solutions, the creation of a department to apply lean office, with Kaizen and Vsm being recommended for implementation. A team-centered approach are some of the proposed solutions (Freitas *et al*., 2018; da Silva *et al*., 2015; de Almeida *et al*., 2017).

For the category people, the findings of some of the authors of this article generally involve dissatisfaction of employees where pressure for perfection, excessive vigilance, availability and simplification associated with excessive standardization of activities end up reducing autonomy, empowerment and a sense of belonging (Liker & Morgan, 2006; Carter *et al.*, 2011) in addition to negative reactions such as a feeling of more work (Monteiro *et al.*, 2015) or a sense of oversight in the approach to implementation, which puts employees on the defensive (Secchi & Camuffo, 2019).

Here, the concept of standardization stands out as it can be a problem for environments in which routine activities are not so present. Liker and Morgan (2006) claim that it is possible to define the exact way and time to perform any repetitive task, and they can be done in a safer and more efficient way, in addition to which standardization helps the executors to see the waste. The problem is that the office worker tends to believe that his work, unlike the factory worker, is not tied to a daily routine or any kind of predetermined pattern.

It is important to understand that in office environments the range of demands becomes more diverse, less repetitive and requires the engagement of the workforce, since the human factor appears to become a focal point for such application (Liker & Morgan, 2006).

There are also records of employees who believed in the lean office, employees who, even after the completion of an event, remained attentive to find improvements (Monteiro *et al*., 2015; Magalhães *et al*., 2019). The authors Freitas *et al.* (2018) and Leyer *et al.* (2020) saw that implementing lean office makes people motivated and increases their responsibility for activities.

It is part of human nature to feel motivated by activities with characteristics such as autonomy, multi-skills, task identification and feedback on work generate team satisfaction (Minh, Zailani, Iranmanesh, & Heidari, 2018).

In the category of application challenges, author Di Pietro et al. (2013) pointed out that there are few studies that talk about the sustainability of applications after they have been carried out and ask how to maintain lean after a Kaizen event. It is also said that it is impossible to apply lean without management support (Garrett & Lee, 2010).

It is seen as an application challenge where isolated initiatives become a barrier to lean office implementation (de Almeida *et al.*, 2017). In addition to the fact that in some works such as the authors Secchi and Camuffo (2019), the lean practices adopted did not change or improve the operation and despite the effect of lean on the offices having happened, the researchers could not see these effects translated into productivity.

The service sector in general complains about the negative effects of the lean office implementation (Leyer *et al.*, 2020). The same author states that there is a gap between the official implementation of lean as well as its techniques and subsequent applications.

In the category ways to see the principles, methods and tools of lean applied to administrative activities, once again the understanding of the importance of being a humble organization that learns where the rigidity in applying the concepts must be rethought (de Almeida *et al*., 2017; Liker & Morgan, 2006).

Authors such as Freitas & Freitas (2020) say that lean should be investigated in the most varied contexts possible, especially now that the digital environment is becoming the production environment. The principles of continuous flow and an integrated value chain can be applied to offices in a completely different way due to digitization (Kämpf, 2018).

New ways of seeing and using concepts such as flow leveling should be addressed for solutions that integrate processes (Di Pietro et al., 2013). The author's work encouraged campaigns for service via telephone and online and allowed users to complete forms on their own, in order to ensure leveling and relieve sectors.

6. Conclusion

This study performed a systematic review of the lean office where initially 238 papers were found and 18 met the selection criteria. The topic is still poorly researched and there is a predominance of publications in the United Kingdom and the United States.

It is also recognized that lean tools when used in administrative areas are more difficult to operationalize, as variations in processes are greater than those in the manufacturing environment (Monteiro et al., 2015). Some features such as intangibility, simultaneity and heterogeneity also make this application difficult (Cavaglieri, 2015).

In this review, lean office application dimensions were analyzed being newspapers that published the theme, publications over time, citation analysis, type of research, area, most used tools, main findings and difficulties, among other criteria that direct this theme to a more holistic and creative discussion. Adaptability in the application strategy, tools and concepts need to be included in the debate on the topic to increase the success rate in the implementation. Furthermore, the informational factor makes the application difficult, mainly associated with cases of lack of sustainability.

It is clear that there is a shortage of a robust body of research for the field associated with a redesign of methods, tools, techniques and practices that, despite being successful in factory environments, no longer repeat the same success in office environments. It is also considered to improve the principles of lean thinking for the area.

Another point is the impact of lean office on the staff, as standardization in processes points out to be reasons for lack of engagement and application failure. Definitely one of the keys to this field of lean is to associate it with people management and active leadership. As a suggestion for surveys detailing how the implementations were conducted, which make comparisons between implementations in offices in different areas, which checks if there is an indication of which tool to start implementation according to the sector and which show possible solutions to difficulties encountered in this area.

The incorporation of the technological environment into the physical is a door that should also be explored in this context in a more comprehensive way, automations are a reality and waste can often be automated along with the process, in addition to the reduction in the execution of repetitive activities makes the human factor even more relevant and promising for administrative environments and activities to reach levels of excellence that will serve as a basis.

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